Appendix G

Hydrologic Analysis

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

OCT 1 RECD

REPLY TO
ATTENTION OF

September 27, 2001

Regulatory Branch (200100338)

Lloyd Burns
Patterson Sand and Gravel
P.O. Box 12
Sheridan, California 95681

Dear Mr. Burns:

I am responding to your request for a Department of the Army permit for the Patterson Sand & Gravel pipeline project. This project is located in Section 31, Township 14 North, Range 6 East, MDB&M, Placer County, California.

Based on the information you have provided, the proposed discharge of dredged or fill material into the Bear River to relocate and bury existing pipelines is authorized by Nationwide Permit Number 12. However, the State of California has denied certification for this nationwide permit. Therefore, use of the nationwide permit is denied without prejudice until water quality certification is obtained from the Regional Water Quality Control Board at the address below. Work may then proceed subject to the terms and conditions of certification. The work must also meet the terms and conditions listed on the enclosed nationwide permit information sheets and be constructed during the low flow season, in accordance with the enclosed September 21, 2001 letter from the National Marine Fisheries Service. **Upon completion of the work authorized by this permit, the permittee must sign and return the enclosed compliance certification as required by General Condition 14.**

This verification is valid for a period of two years from the date of this letter or until the nationwide permit is modified or expires, whichever comes first. This nationwide permit is scheduled to expire on February 11, 2002.

Additionally, based on the information provided on your behalf, proposed expansion of your mining operation over the next 60 years may affect the federally listed Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*). This expansion as proposed does not involve any discharge of dredged or fill material into waters of the United States or require a Department of the Army permit. Therefore, separate consultation with the U.S. Fish and Wildlife Service (FWS), pursuant to the Endangered Species Act may be required. We recommend you contact the FWS office at the address below before initiating the proposed expansion.

Please refer to number 200100338 in any correspondence concerning this work. If you have any questions, please write to Mr. William Ness, Room 1480, or telephone (916) 557-5268.

Sincerely,

ORIGINAL SIGNED

Tom Cavanaugh
Chief, Sacramento Valley Office

Enclosures

Copies Furnished: w/o Enclosures

James McKevitt, North Fork Associates, 457 Grass Valley Highway, Suite 12, Auburn, California 95603
Jan Knight, U.S. Fish and Wildlife Service, Endangered Species Division, 2800 Cottage Way, Suite W2605, Sacramento, California 95825
Howard Brown, National Marine Fisheries Service, 650 Capitol Mall, Suite 8-300, Sacramento, California 95814

SEP 24 RCD

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

September 21, 2001

In Reply Refer To:
SWR-01-SA-6030:HLB

Mr. Tom Cavanaugh
Chief, Sacramento Valley Office
U.S. Army Corps of Engineers
1325 J Street
Sacramento, CA 95814-2922

Dear Mr. Cavanaugh:

This letter responds to your June 20, 2001 request for National Marine Fisheries Service (NMFS) formal consultation on the proposed Patterson Sand and Gravel pipeline project. You have determined that this project may affect federally listed endangered Sacramento River winter-run chinook salmon (*Oncorhynchus tshawytscha*), threatened Central Valley spring-run chinook salmon (*O. tshawytscha*), threatened Central Valley steelhead (*O. mykiss),* candidate Central Valley fall/late fall-run chinook salmon (*O. tshawytscha*), and their respective designated critical habitat or essential fish habitat (EFH).

The U.S. Army Corps of Engineers (Corps) is proposing to permit the relocation and burial of six polyethylene water transfer pipes from the floodplain of the Bear River to a trench beneath the floodplain. The project involves excavating a trench approximately 400 feet long, five feet deep, and six to eight feet wide and moving the six pipes from the surface of the floodplain into the trench. Following the pipeline relocation, the trench would be backfilled with sand and small gravel to a depth of two to three feet, and with six to twelve inch gravel for the remainder of the trench depth, sufficient to grade the floodplain to it's original contour.

Following your initial July 20, 2001 request for formal consultation, NMFS requested additional information on August 8, 2001. The applicant's representative, James McKevitt, of North Fork Associates, supplied the requested information on September 17, 2001. This information was supplemented by a site visit by NMFS fisheries biologist Mr. Howard Brown on September 19, 2001. During the site visit, Mr. Brown discussed project details with Mr. McKevitt and Mr. Lloyd Burns, general manager of Patterson Sand and Gravel. Mr. Brown felt that if the project were conducted during the low flow season, the project would not have an adverse effect on listed salmonids and formal consultation would, therefore, not be necessary.

Provided that a low flow work window of June 30 to October 30 is adhered to, NMFS believes that the Patterson Sand and Gravel pipeline project is not likely to adversely affect listed or candidate salmonids or their critical habitat and essential fish habitat. This concludes Section 7 and EFH consultation for the proposed project. However, should new information indicate that the project may effect these species in an unforseen manner, further consultation may be necessary.

If you have any questions regarding this correspondence or if NMFS can provide further assistance on this project, please contact Mr. Howard Brown in our Sacramento Area Office, 650 Capitol Mall, Suite 8-300, Sacramento, CA 95814. Mr. Brown may be reached by telephone at (916) 930-3608 or by Fax at (916) 930-3629.

Sincerely,

Rebecca Lent, Ph.D.
Regional Administrator

cc: NMFS-PRD, Long Beach, CA
Stephen A. Meyer, ASAC, NMFS, Sacramento, CA
Lloyd Burns, Patterson Sand and Gravel, P.O. Box 12, Sheridan, CA 95681
James McKevitt, North Fork Associates, 457 Grass Valley Hwy., Suite 12, Auburn, CA 95603

Hydrologic Analysis

Bear River

Placer County, California

for

Patterson Sand & Gravel

Prepared by

MBK ENGINEERS
2450 Alhambra Blvd., 2nd Floor
Sacramento, CA 95817

November 2001

Table of Contents

List of Figures

Purpose:

Patterson Sand and Gravel (PS & G) is proposing to expand its' mining area by approximately 300 acres on the Flood plain terrace adjacent to the Bear River. The purpose of this report is to investigate potential flooding associated with the expansion of the Patterson Sand & Gravel operation on the Bear River in Placer County, California. This study is expected to assist in the development of mining and reclamation plans for the project and provide data for environmental documents.

Background:

The area planned for mining is on the flood plain terrace of the Bear River, three miles upstream of Highway 65. The drainage area at Hwy 65 consists of 292 square miles. Camp Far West Reservoir (completed in 1964) is two (2) miles upstream of the mining site. Approximately one (1) mile downstream of Camp Far West Reservoir is a concrete diversion dam for irrigation in the South Sutter area. The diversion dam is an ogee spillway about 20 feet high and is operated from April 15 to October 15. The diversion dam existed prior to the construction of Camp Far West Reservoir.

Physically, the drainage area is approximately 60 miles long in an east- west direction and averages 15 miles on width (Figure 1 is a location map). Typical plant life consists of grassland mingled with shrubs and trees. Soils are generally free draining. Normal annual precipitation through the basin ranges from 20 to 60 inches. A drainage area map with normal annual precipitation contours is attached as Fig. 2.

Hydrologic Analysis

Generally, rain floods can occur in the study area any time between November and April. This type of flood is characterized when antecedent rainfall has resulted in saturated ground conditions, and is then followed by prolonged heavy rainfall. The resultant flood produces high to moderate peak flows and large runoff volumes. Cloudburst storms may occur any time from late fall to early spring, and may occur as an extremely severe sequence within a general winter rainstorm. These are high-intensity storms that can produce peak flows equal to or greater than those of the general rainstorm. High peak flows, short duration flood flows, and a small volume of runoff characterize flooding from these cloudbursts.

The project reach is located on the Bear River about 14 miles upstream of its confluence with the Feather River. The Bear River drains a basin between the Yuba and the American River Basins. The Bear River Basin begins near Emigrant Gap at an elevation of 5300 feet and drops rapidly through steep-sided canyons before emerging into the foothill region (at an elevation of 120 feet), and then travels westerly across the valley floor to join the Feather River about three miles north of Nicolaus. The US Geological Survey (USGS) has maintained a stream gage near Wheatland with a contributing drainage area of 292 square miles.

The Wheatland gage is approximately six miles downstream of the Camp Far West Dam site. Stream flow records are available from the USGS which has operated the gage from October 1928 to present. The largest recorded peak flows in the Bear River at the gage near Wheatland are presented in Table 1.

Table 1
Bear River Peak Flow (cfs)
USGS gage near Wheatland

Date	Peak Flow (cfs)
April 8, 1935	21,600
January 21, 1943	31,300
November 21, 1950	29,100
December 22, 1955	33,000
October 13, 1962	27,700
January 6, 1965	12,700 [1]
January 22, 1970	21, 900 [1]
February 19, 1980	16, 900 [1]
December 20, 1981	28,200 [1]
February 17, 1986	48,000 [1]
March 23, 1995	17,500 [1]
January 2, 1997	34,900 [1]
[1] Dec. 27, 1964 storm and subsequent events effected by regulation of Rollins and Camp Far West Reservoirs.	

The US Army Corps of Engineers conducted a hydrologic analysis in their September 1972 Feasibility Report on the Bear River. This included a flood frequency analysis of the Bear River at the Wheatland gage. Figure 3 is a copy of the peak flood frequency curve at the Wheatland gage. The references to natural conditions refers to conditions prior to 1958. Pre-project conditions refer to conditions after the completion of Rollins and the Camp Far West Reservoirs. As part of the Corps' study, an illustration, Figure 4, was developed to show areas subject to flooding problems. The proposed PS & G project site is partially located in this flood prone area.

Hydraulic Analysis

The US Army Corps of Engineers' computer program HEC-2 (US Army Corps of Engineers, 1990) was used to compute water surface elevations in the subject reach. The HEC-2 computer modeling program was developed by the US Army Corps Engineering of Hydrologic Engineering Center (HEC) in Davis, California. HEC-2 is widely used in flood plain management applications, including flood insurance studies. The model can compute the water surface of both subcritical and supercritical flow regimes. The effects of various special flood plain conditions, such as levees, fill, bridges, culverts or weirs can be analyzed by the model. The program is designed to calculate water surface profiles for steady state (constant discharge) flow in natural or manmade channels. The computational procedure used by HEC-2 is generally known as the "Standard Step Method" and is based on the solution of the one-dimensional

energy equation. This procedure evaluates the energy loss due to friction by using Mannings equation.

Roughness factors (Mannings "n") used in computations were chosen by engineering judgment and based on field observations. Roughness values for the main channel of the Bear River range from 0.03 to 0.032 and 0.036 to 0.048 for the over bank flood plain.

Cross sections input into the model for the backwater analysis were obtained from aerial topography from 1997 at a scale of 1" = 200' and a contour interval of 2 feet (NGVD25). Cross sections were verified with additional field cross sections in June, 1999. Figure 5 shows the cross section locations in the study area.

Starting water surface elevations for use in the model were determined using the slope area method. A slope of .0008 to 0.001 was assumed as a starting point by comparing average upstream energy grade lines for the applicable flow.

Calibration

Prior to hydraulic comparison of existing and project conditions, the HEC-2 model was calibrated with the best available data for the February 17, 1986 storm event. High water mark data (HWM) was researched and collected from available sources, (USGS). The Wheatland gage had a peak stage of 93.52 (NGVD29) during the February 17, 1986 event. Plotted on Figure 6 is the February 17, 1986 profile with the HWM data.

Existing Condition

Once the model was calibrated, water surface elevations and velocity data was calculated for the 2year, 10year, 100year, and 500year events. Water surface elevation data is plotted on Figure 7, and corresponding velocity data is plotted on Figure 8.

The result shows that there is minor over bank flooding on the right, (north) bank and downstream of the cross section at RM 15.16. Figure 9 is a plan showing the existing condition flood boundary for the 100year storm event.

Proposed Project

The project proposes to mine from alluvial deposit on the off – channel terrace on the right bank between River Mile 14.24 to 15.0. Mining is currently being conducted upstream of the proposed mining area. Each subsequent excavation phase will proceed in a downstream direction. An existing haul road and bridge are in place for transporting aggregate to the existing plant site on the left, (south) bank. Figure 10 shows the existing and proposed mining facilities.

To examine the effects of the proposed project on the hydraulics of the Bear River, the existing conditions HEC-2 model was modified to include features of the proposed project. Two project improvement scenarios were tested. The first scenario included a levee on the right bank from river mile (RM) station 14.24 to 15.27. Upstream of RM station 15.27 the existing levee was included in the model. The second scenario included a 100 foot setback levee with an adjacent terrace set at an elevation between the 2yr to 5yr flood depth, from RM station 14.24 to 15.27. The results of both scenarios compared to the existing condition is presented in Table 2.

Table 2

100-Year Flow @ Patterson Sand & Gravel BEAR RIVER HEC- 2 Calculated Water Surface Elevation Results			
RM	Calculated Water Surface Elevations		
	Existing Condition	Levee on top of existing bank.	Setback Levee with A 100' Terrace
13.50	105.80	105.80	105.80
14.24	110.27	110.28	110.11
14.53	113.32	113.47	112.76
14.73	115.59	115.81	114.65
14.85	117.80	117.82	116.60
15.04	119.93	120.22	118.40
15.16	119.91	120.21	118.39
15.27	120.24	120.60	119.03
15.39	121.11	121.38	120.34
15.54	121.96	122.18	121.34
15.78	124.09	124.18	123.93
15.94	125.11	125.17	124.99
16.18	126.19	126.24	126.10
16.39	128.02	128.05	127.96
File name	Bearrvr. HC2	Bearvrp. HC2	Bearvrb. HC2

For both the scenarios, the proposed features prevents over bank split flow occurring on the right bank. The levee scenario shows a maximum 0.4 feet increase in the 100yr water surface elevation, while the terrace scenario shows a maximum 1.5 feet decrease in the 100yr water surface elevations. Figure 11 shows a typical cross section for each scenario.

Additional Data

- FEMA The Federal Emergency Management Agency (FEMA) is responsible to provide participating communities flood hazard data for flood insurance purposes. A

flood insurance study was performed in Feb. 1983 and revised Jan. 1987 for Placer County.

The Bear River was studied by FEMA with approximate analyses. The method of study is dependent on development potential or flood hazards. Figure 12 is a copy of the Flood Insurance Rate Map (FIRM) for the project area. The area is mainly in a Zone A designation. Zone A is defined as an area inundated by the 100-year flood, determined by approximate methods. No base flood elevations are provided.

- OES The Office of Emergency Services (OES) requires an inundation study for dam failure analysis under Chapter 7 of Division 1, Title 2 of the Calif. Government Code, Section 85895. This analysis was performed for the Camp Far West Dam in Sept. 1992. The study assumes a catastrophic failure of the dam and calculates a failure hydrograph at the dam. The failure hydrograph is routed downstream to estimate an inundation area. The analysis shows a portion of the project, closest to the main channel, could be inundated.

- Stream Capture (River Realignment) Stream capture results when a river breaches its bank and flows into the adjacent overbank area to form a new active channel. The previous active channel is essentially abandoned. This type of channel realignment occurs in natural river development when meanders are cut off and the river realigns through the neck of a meander. Because the flood path across the neck of the meander is shorter than the flow path around the exterior of the meander, the river cuts a new path. The meander bend then becomes an oxbow which no longer carries the low flow channel but acts as a storage area during flood periods [WET, 1990]. If mining occurs on the inside of river meanders, the process of forming a new low flow channel can be inadvertently facilitated. Mining activities that extend to and below the existing channel thalweg can facilitate the stream capture process. If a breach occurs, and the breach erodes to the channel thalweg, the low pit area offers a path of least resistance.

  An example of the stream capture scenario described above was documented by California Department of Water Resources on the Merced River at the Magneson site upstream of Highway 99. In 1983 a large flood (25% larger than bank capacity) occurred on the Merced River which breached the bank on the upstream end of the Magneson mining site. This breach and the subsequent breach of the bank at the downstream end of the pit allowed the Merced River to cut off the river bend at this location. A new shorter river path was established through the pit and the original river channel became an oxbow area. Because the channel realigned itself through the mining pit, migratory fish were required to pass through a deep pool and became subject to predation in the pool area. As part of a fishery enhancement program, DWR is restoring the river to its original location by isolation the pit from the river. The key factor leading to the capture of the active channel by this pit was that a shorter flowpath was established for the river through the pit. This shortening of the river causes the river to make adjustments both upstream and downstream of the shortened river reach as the river tries to establish an equilibrium between stream

gradient, sediment carrying capacity and flow distance. As noted previously, rivers naturally go through this process in the building and cutting off of meanders.

Summarizing, the elements required for stream capture are:

1. The bank must breach between the pit and the river.

2. The water entering the pit must be able to establish a new river course in the overbank area to allow it to flow downstream and to rejoin with the river.
3. Prior to a new channel forming, an opening must exist, or a second breach must occur downstream, allowing captured flows to return to the river channel at a point downstream.

4. This new course must be more efficient (shorter path) than the original river course so that the river relocates its active channel to the new river course.

   A qualitative review of the current river alignment, river bank width, and pit locations indicates that it is extremely unlikely that the four elements described above would occur for stream capture at the project site.

   Two lake reclamation's are planned and shown in the project reclamation plan. These lakes represent a potential for stream capture. Other mining areas show finish grades at or above the adjacent stream thalweg and are thus less likely to lend themselves to stream capture.

   The proposed lake located at river mile 16.18, on the left bank, has a relatively narrow levee separating it from the Bear River. If this levee failed, water could fill the pit. To proceed further downstream river water would need to create a second downstream breach. Since the downstream area is protected by several levees and high ground it is extremely unlikely that a single event could form a downstream breach. As a result a new course could not form and the river would return to its normal thalweg when the flood receded.

   The proposed lake located at river mile 14.73, on the right bank has a wide bank separating it from the Bear River. If this bank eroded and failed, water could fill the pit. To proceed further downstream river water would need to create a second downstream breach. One possible route for a stream capture scenario is shown on figure 12. However, this route would require downstream erosion of a large portion of the overbank and connection to the existing drainage. This route would require the erosion and formation a 2000 foot long channel that is more efficient than the existing channel. As a result it is extremely unlikely that a single event could result in stream capture.

- State Reclamation Board The State Reclamation Board regulates activities in Designated Floodways and on Project Levees to ensure that adequate flood protection is maintained and to prevent any enroachment or activity that would

adversely affect the capacity, operation, or maintenance of the flood control works. The Board issues Enroachment Permits for activities on levees and the flood plain in its jurisdiction under Title 23, Diversion1 of the California Code of Regulations.

The proposed project may require an Enroachment Permit from the Reclamation Board.

Conclusion

The study results show that under existing conditions the natural overflow of the Bear River occurs as shallow flooding on the right bank in the project area. These overbank flows flood the existing fields and follow the overbank drainage contours, returning to the Bear River channel about 1.8 miles downstream.

Confining flows in the project area results in minor increases to river stages of up to 0.4 feet. The increased stages are localized to the project area. Calculated water elevations downstream and upstream of the project remain the same assuming a steady flow analysis. If stage increase are deemed not acceptable levee setbacks and terrace can be incorporated into the project to mitigate for hydraulic impacts. The study results show that 100 foot setback levees and terrace can mitigate for hydraulic impacts.

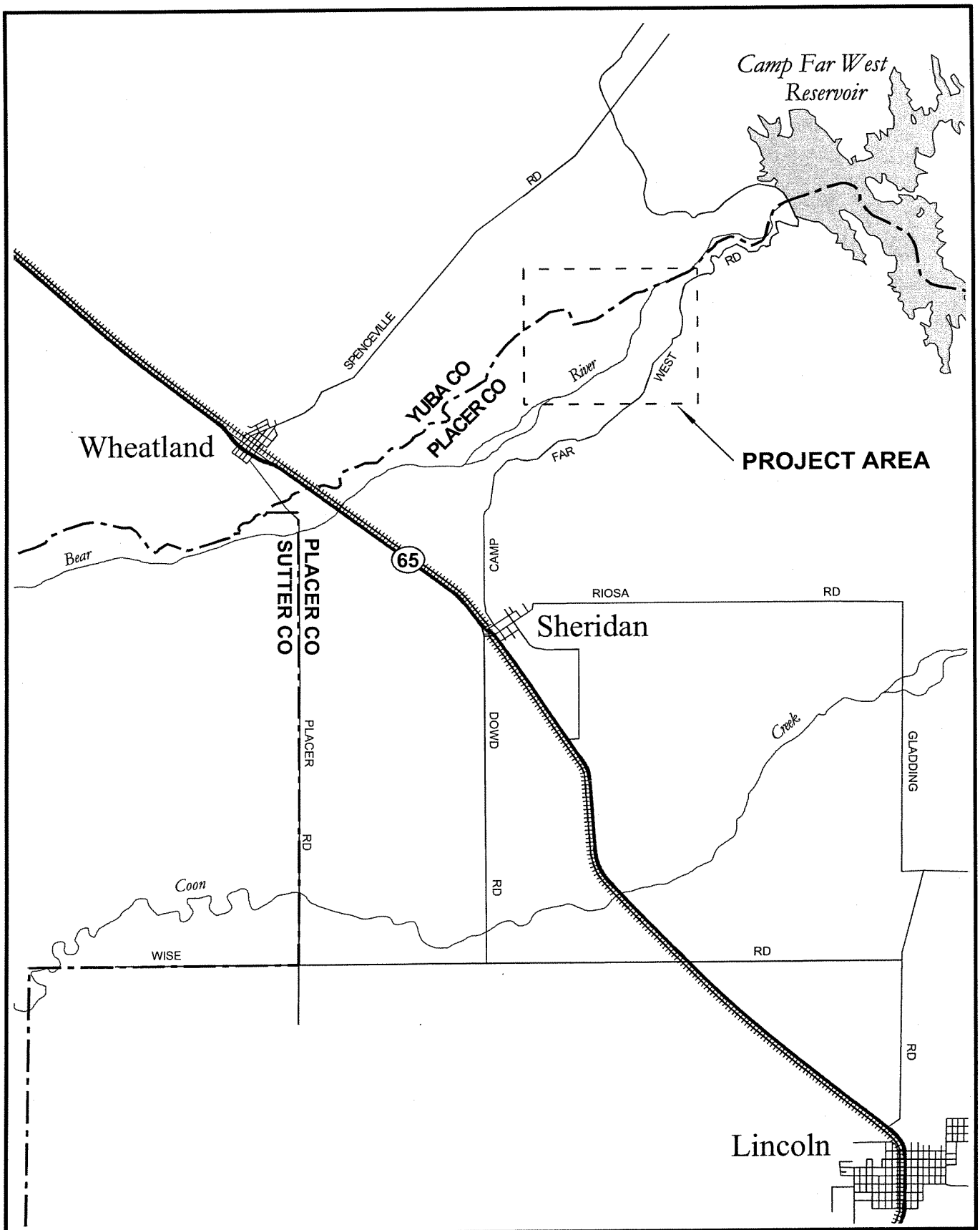
In areas where there are steep banks, and the potential for lateral movement of the river, proposed levees should be setback at least 100 feet. Lateral erosion of the river bank is a factor in long term stability. Flow rate and the velocity of the water are primary factors determining the rivers ability to move material and lateral movement of the river bank. During storms hillsides and small creeks are eroded and become sources of sediment where suspended material becomes sorted and deposited according to grain size. Water traversing a bend in the river causes higher velocities to the outside and slower velocities to the inside of the bend. This deposition builds point bars and causes further erosion on the out side bank to avoid levee stability impacts in the future and in accordance with best management practices, new levees should be setback to ensure long term stability and low maintenance.

REFERENCES

Federal Emergency Management Agency. January 1987. Flood Insurance Study, Placer County, California, Unincorporated Areas.

U.S. Department of the Interior, Geological Survey. Magnitue and Frequency of Floods in California, 1977.

U.S. Army Corps of Engineers. Feasibility Report for Water Resource Development, Bear River, Placer County, California. Sacramento District. Sept. 1972.



MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
Phone: (916) 456-4400 • Fax: (916) 456-0253

Patterson Sand & Gravel

Location Map

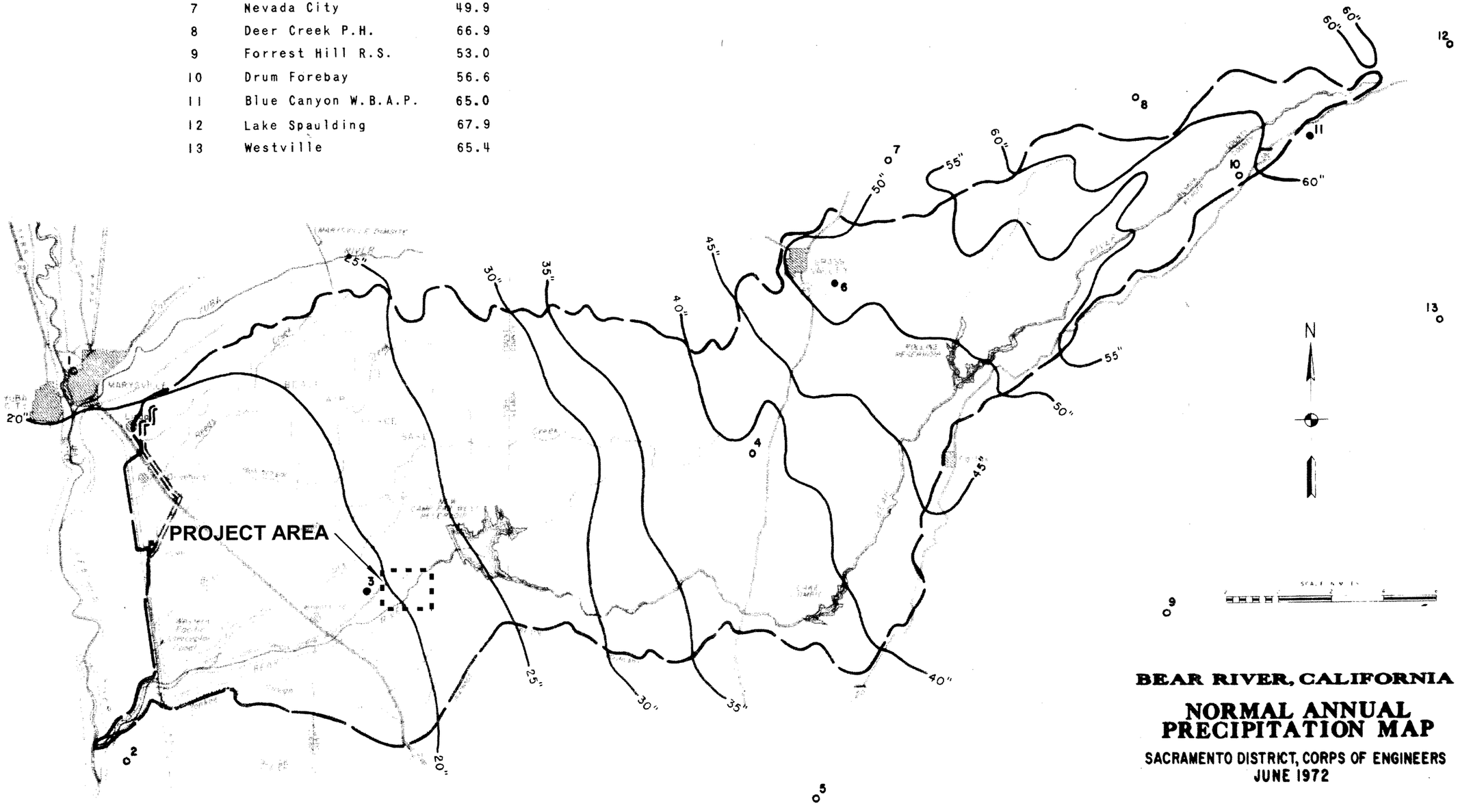
0 2000 4000 6000 8000
Scale in Feet

Figure 1

NO.	STATION NAME	N.A.P.
1	Marysville	20.6
2	Nicolaus	17.2
3	Wheatland 2NE	19.3
4	Wolf Mountain	37.6
5	Auburn	36.5
6	Grass Valley	52.6
7	Nevada City	49.9
8	Deer Creek P.H.	66.9
9	Forrest Hill R.S.	53.0
10	Drum Forebay	56.6
11	Blue Canyon W.B.A.P.	65.0
12	Lake Spaulding	67.9
13	Westville	65.4

LEGEND

- ● Recording station
- ○ Non-Recording station



BEAR RIVER, CALIFORNIA

NORMAL ANNUAL PRECIPITATION MAP

SACRAMENTO DISTRICT, CORPS OF ENGINEERS
JUNE 1972

Scale in Miles: 0, 2, 4, 6

Patterson Sand & Gravel

Drainage Area and Normal Annual Precipitation Map

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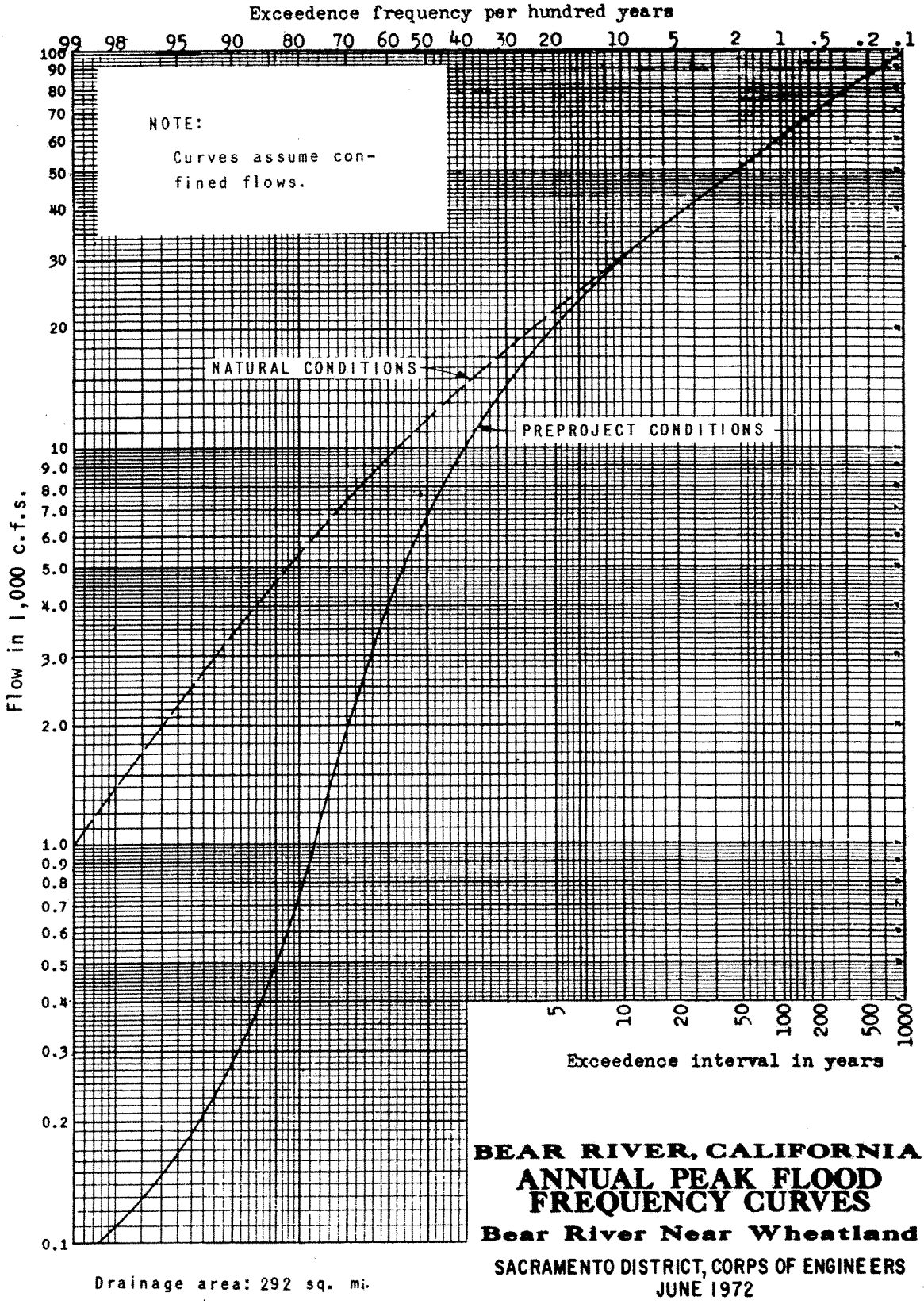
Figure 2



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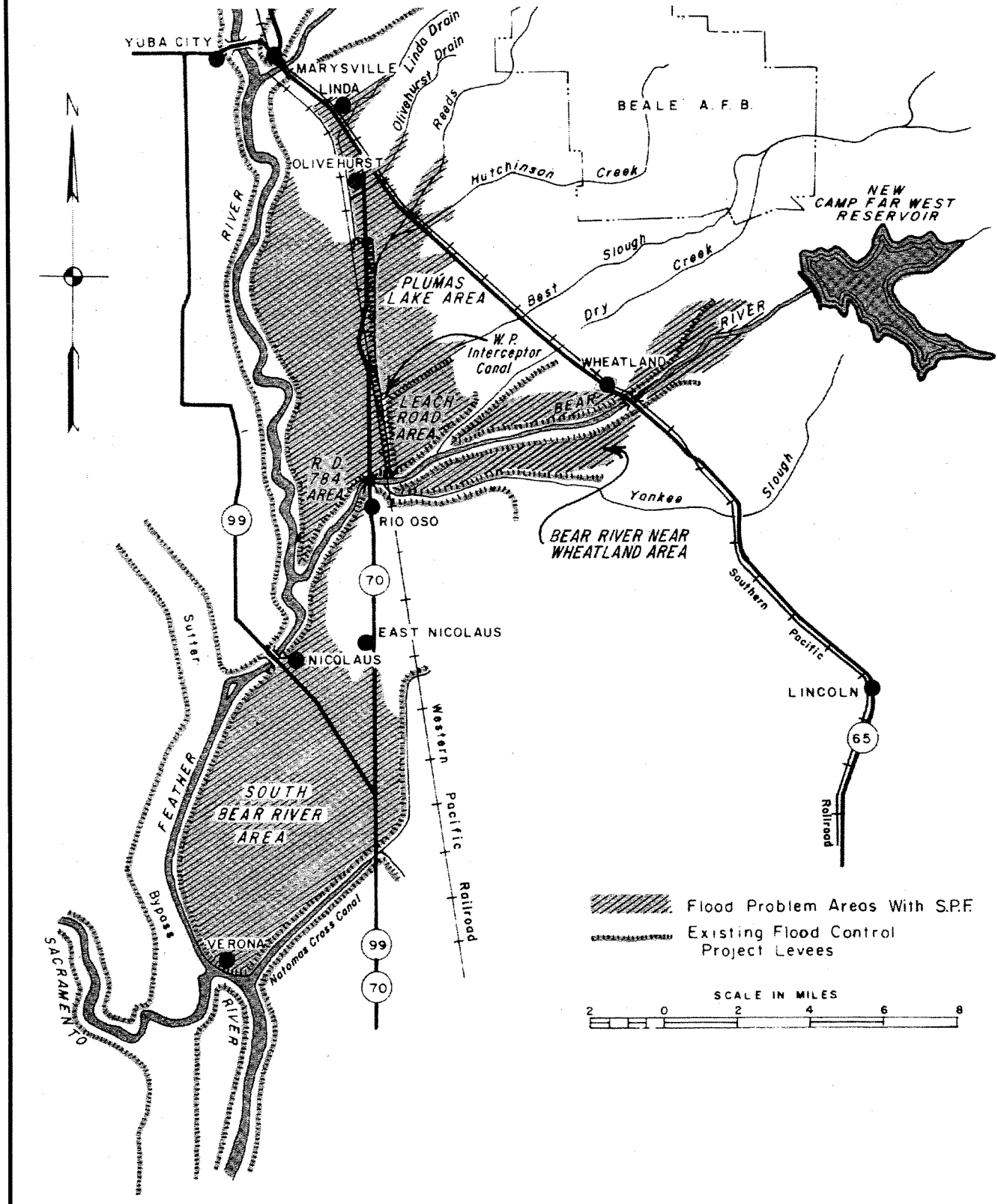
Patterson Sand & Gravel

Bear River near Wheatland - Peak Flood Frequency

Figure 3



Source: Sacramento District, Corps of Engineers - June, 1972

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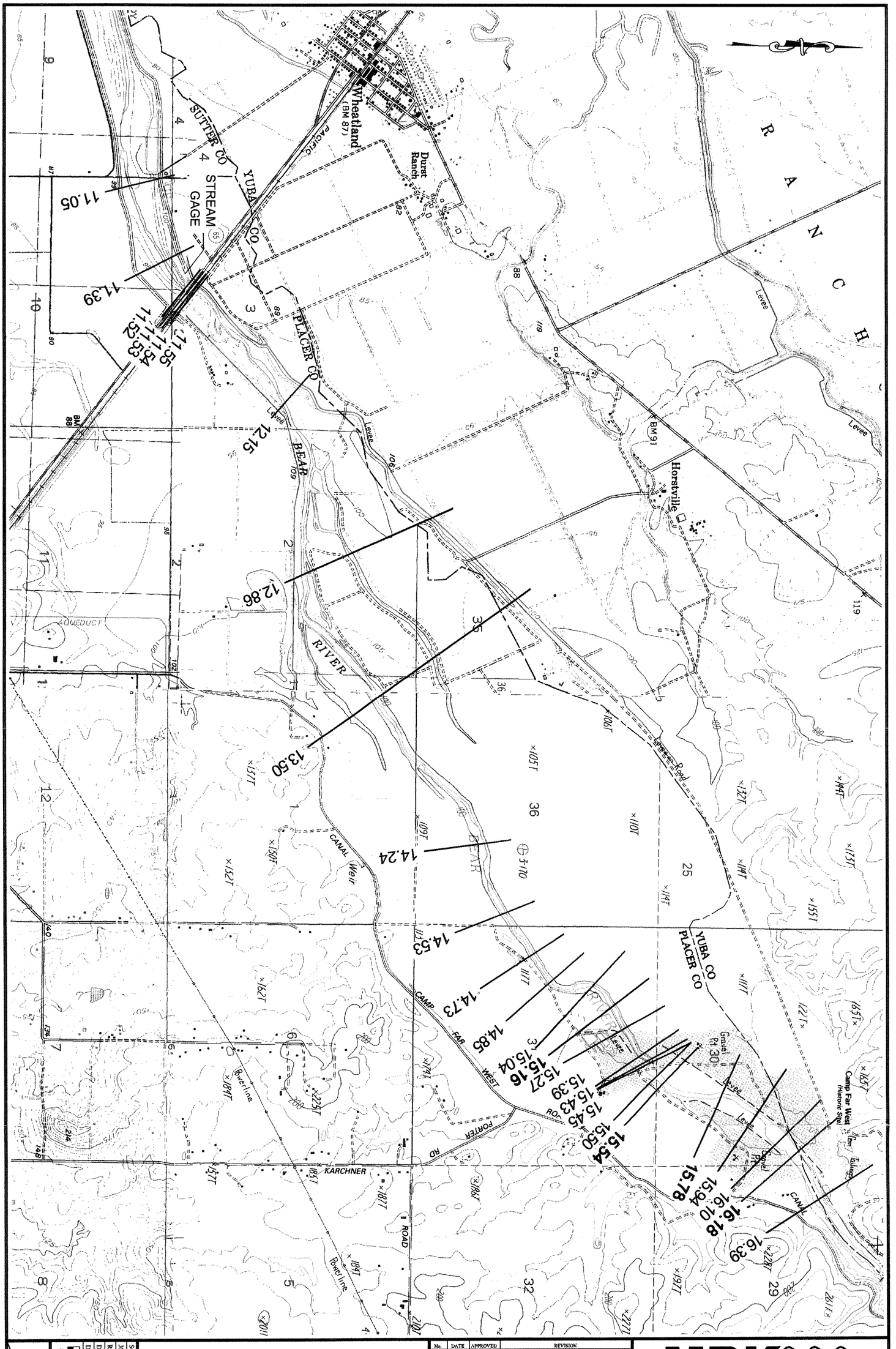
Patterson Sand & Gravel

Flood Prone Areas Map

0 2 4 6
Scale in Miles

Figure 4



Patterson Sand and Gravel

CROSS SECTION MAP

No.	DATE	APPROVED	REVISION

SHEET 1 OF 1 SHEETS

Bar Length On Original Drawing Equals One Inch. Adjust Scales Accordingly

SCALE:	1" = 2,000'
JOB NUMBER:	1965
REQUESTED BY:	MF
DRAWN BY:	RDS
DATE:	October 2001

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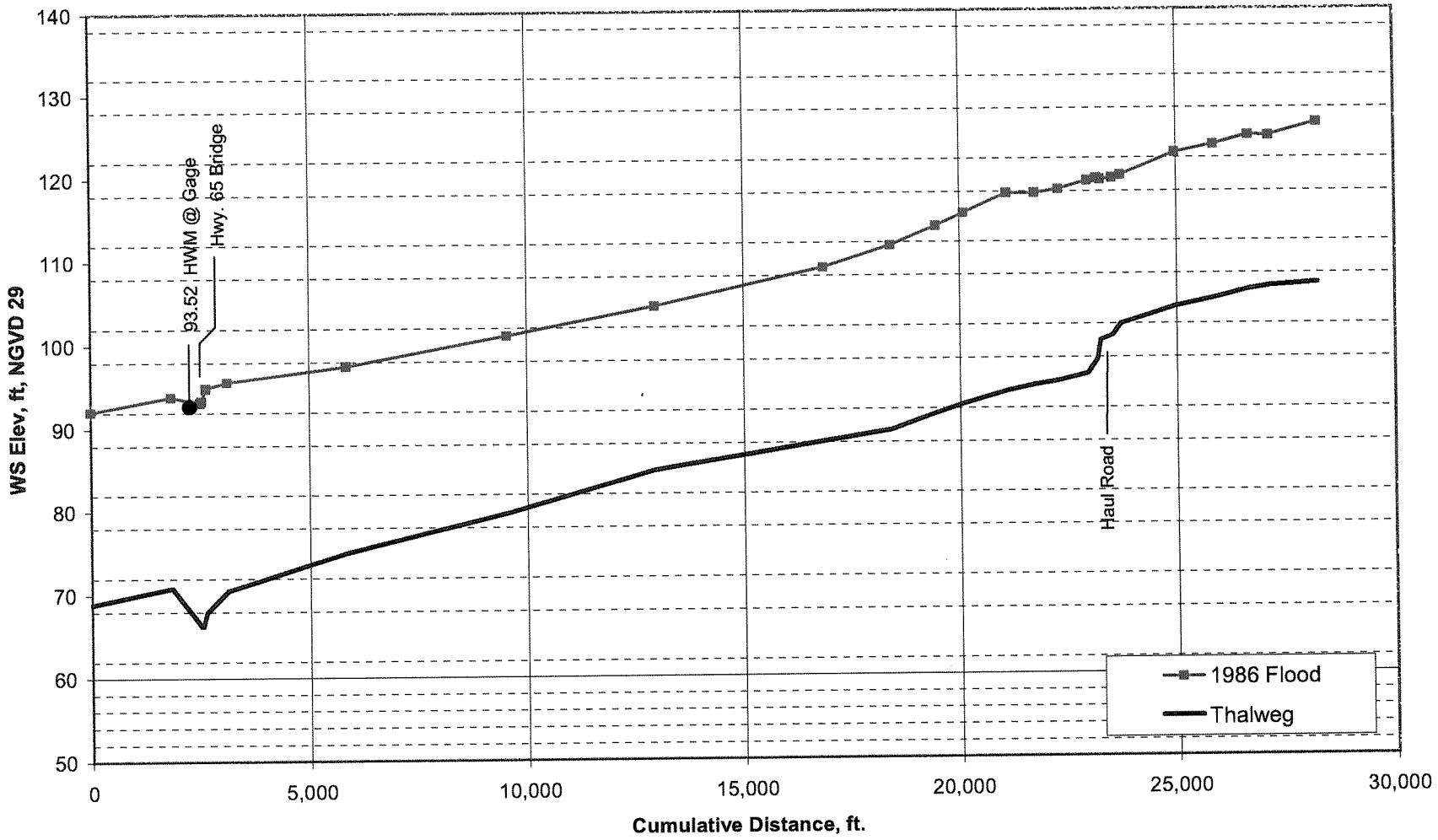
Figure 5



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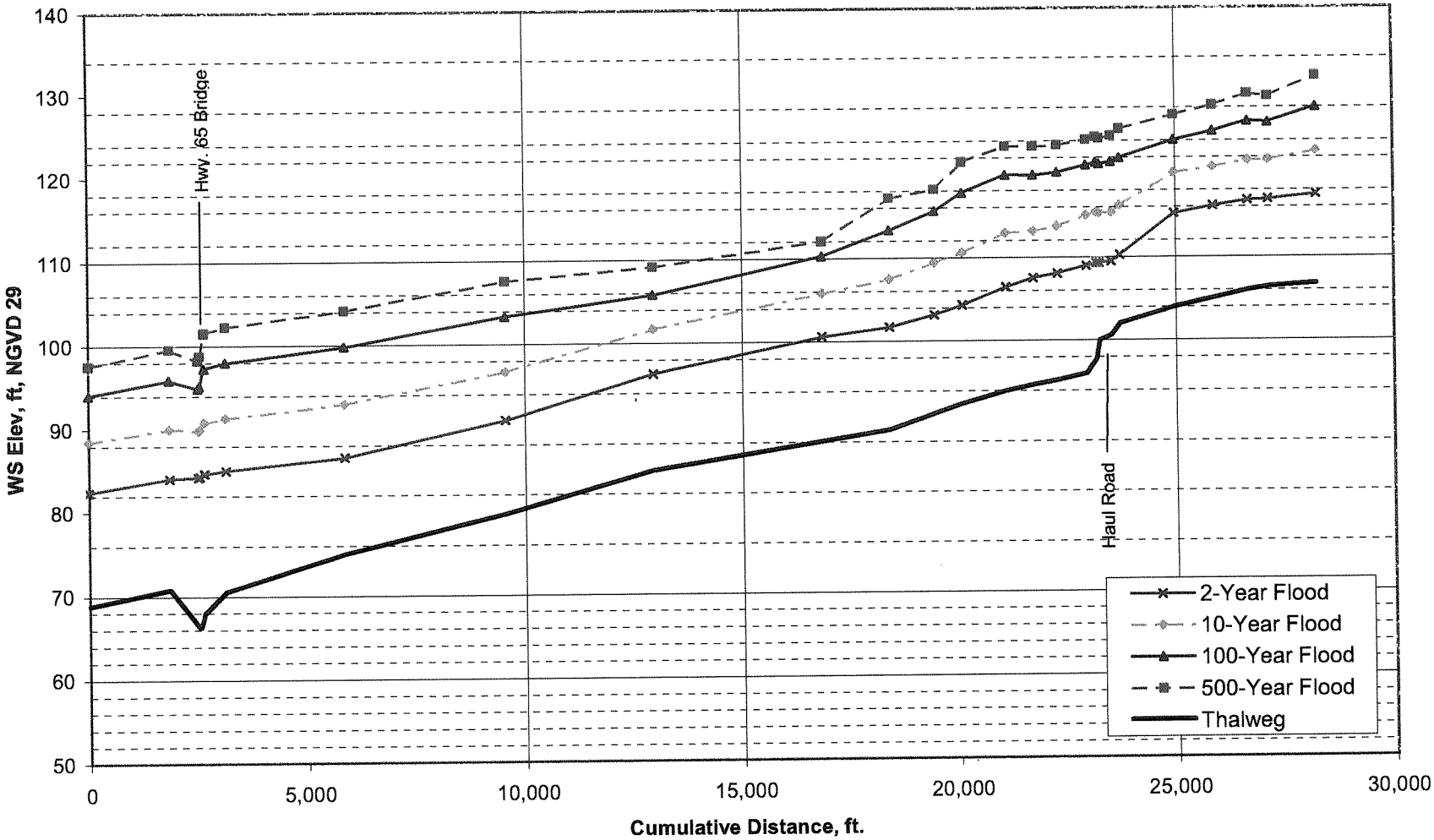
Patterson Sand and Gravel
BEAR RIVER
WATER SURFACE, 1986 FLOOD
48,000 CFS

Figure 6

Bear River
Water Surface Elevation



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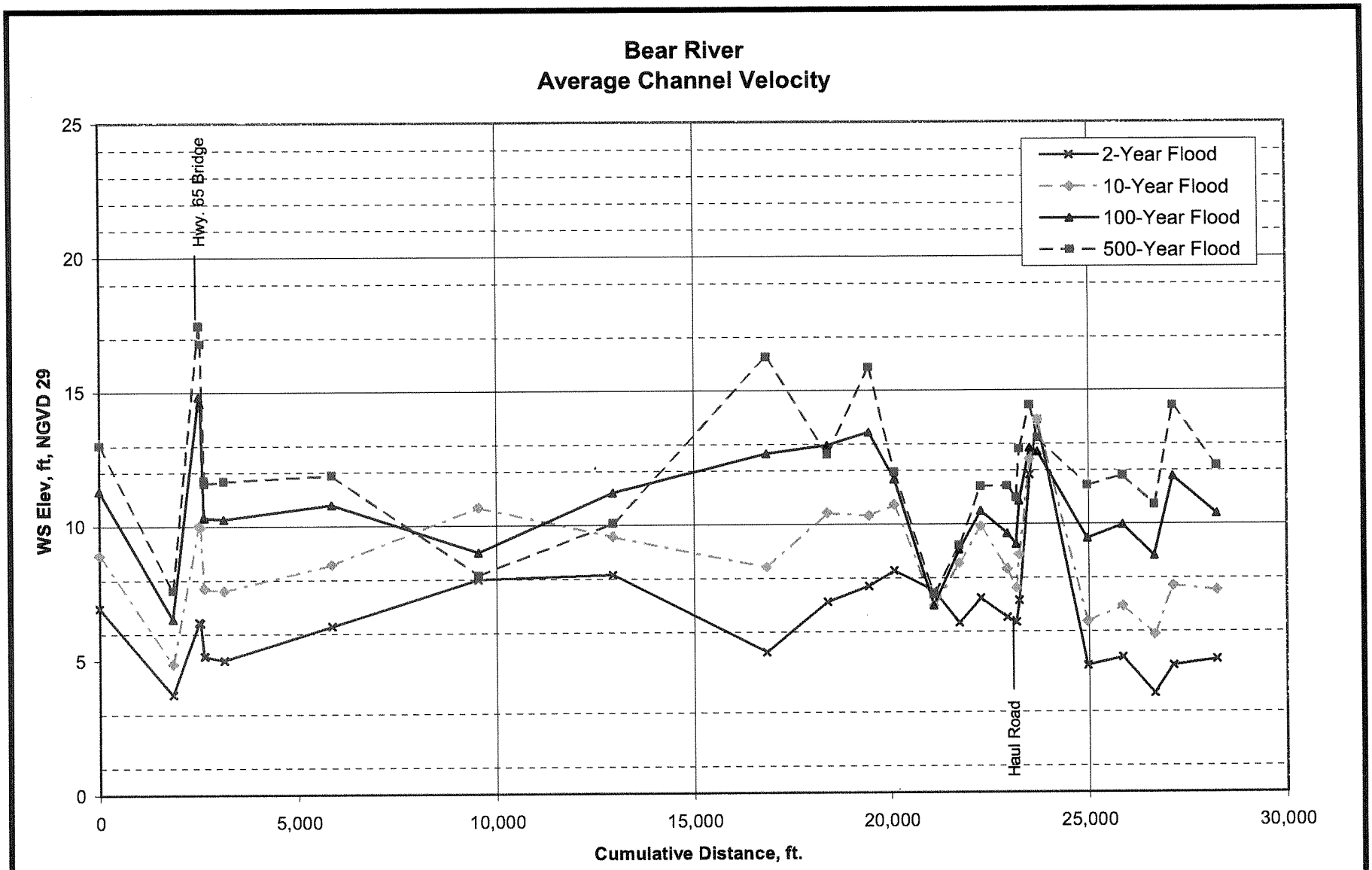
Patterson Sand and Gravel

BEAR RIVER
WATER SURFACE ELEVATION
EXISTING CONDITION

Figure 7



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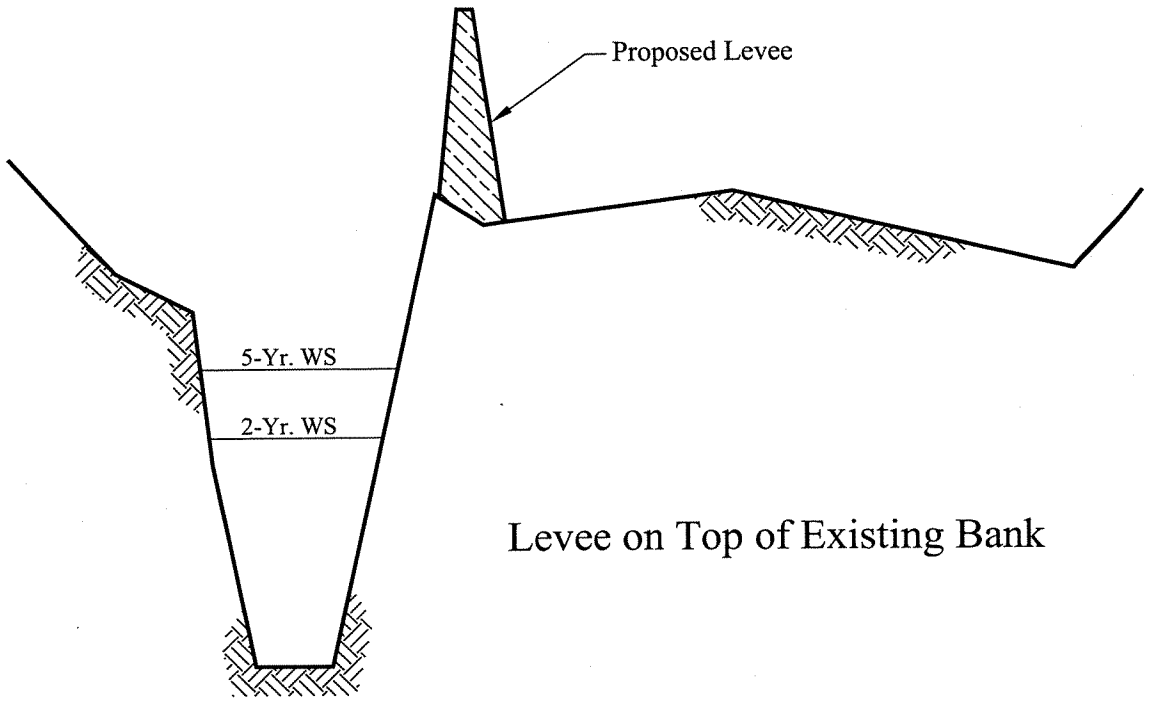
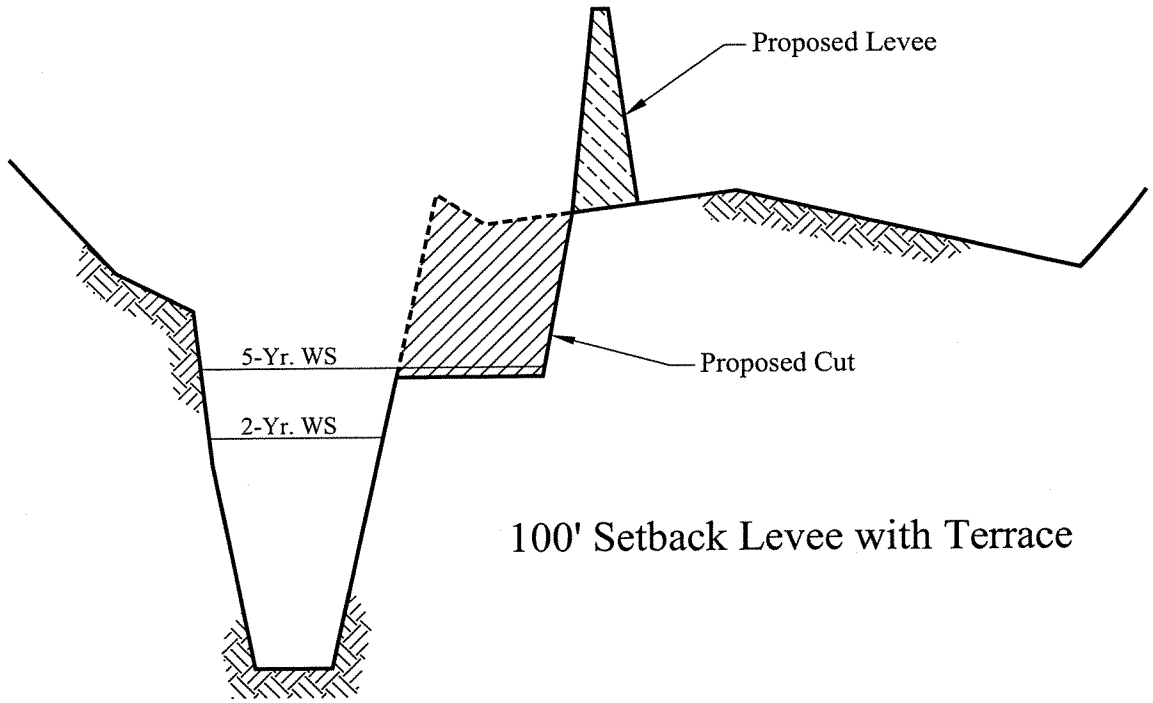
Patterson Sand and Gravel

BEAR RIVER
AVERAGE CHANNEL VELOCITY
EXISTING CONDITION

Figure 8



Levee on Top of Existing Bank



100' Setback Levee with Terrace

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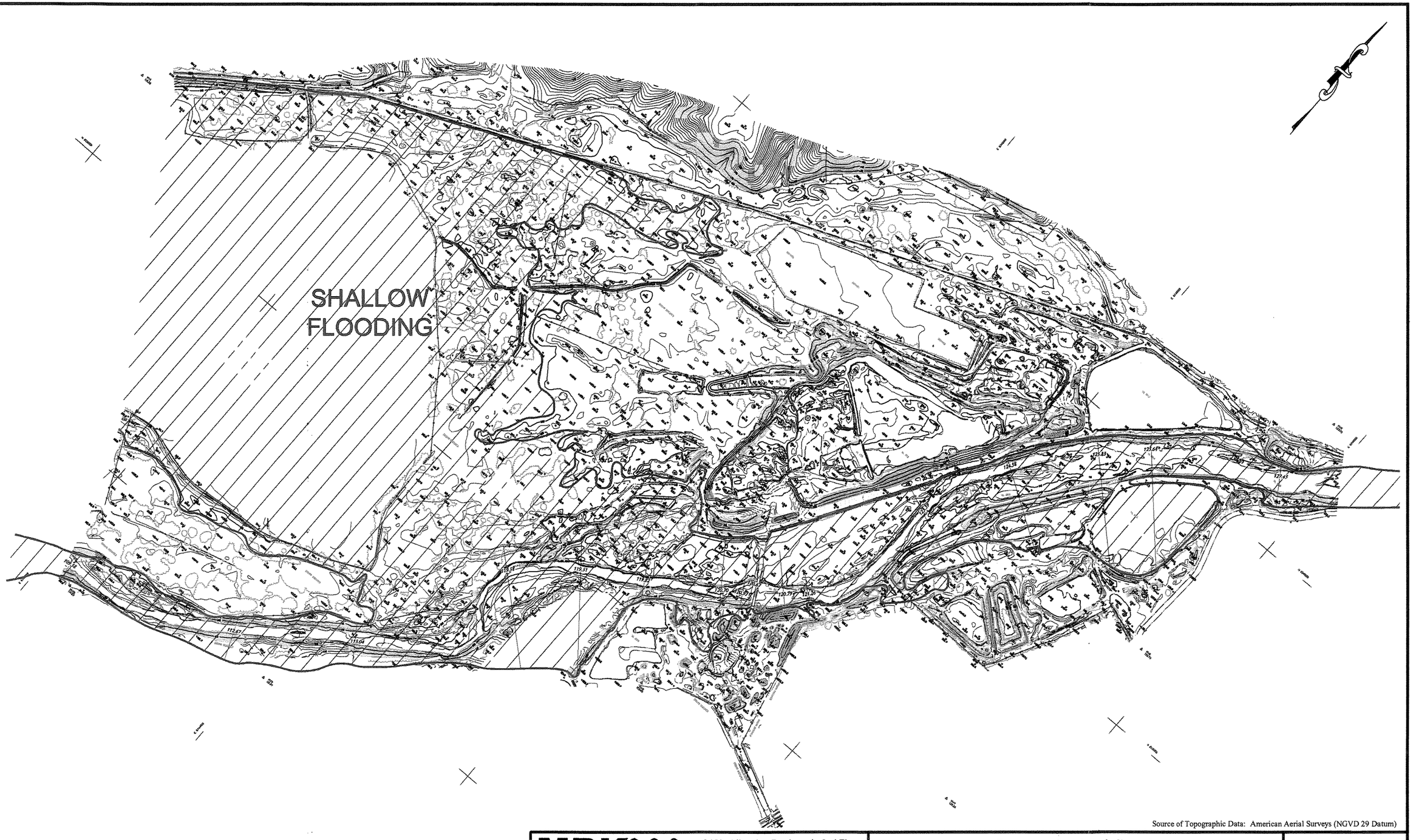
Patterson Sand and Gravel

100' Levee Setback - XS at RM 14.53

SCALE:	1" = 10'
JOB NUMBER:	1985
DRAWN BY:	RS
DATE:	November 2001

Bar Length On Original Drawing Equals One Inch. Adjust Scale Accordingly

Figure 11



Source of Topographic Data: American Aerial Surveys (NGVD 29 Datum)

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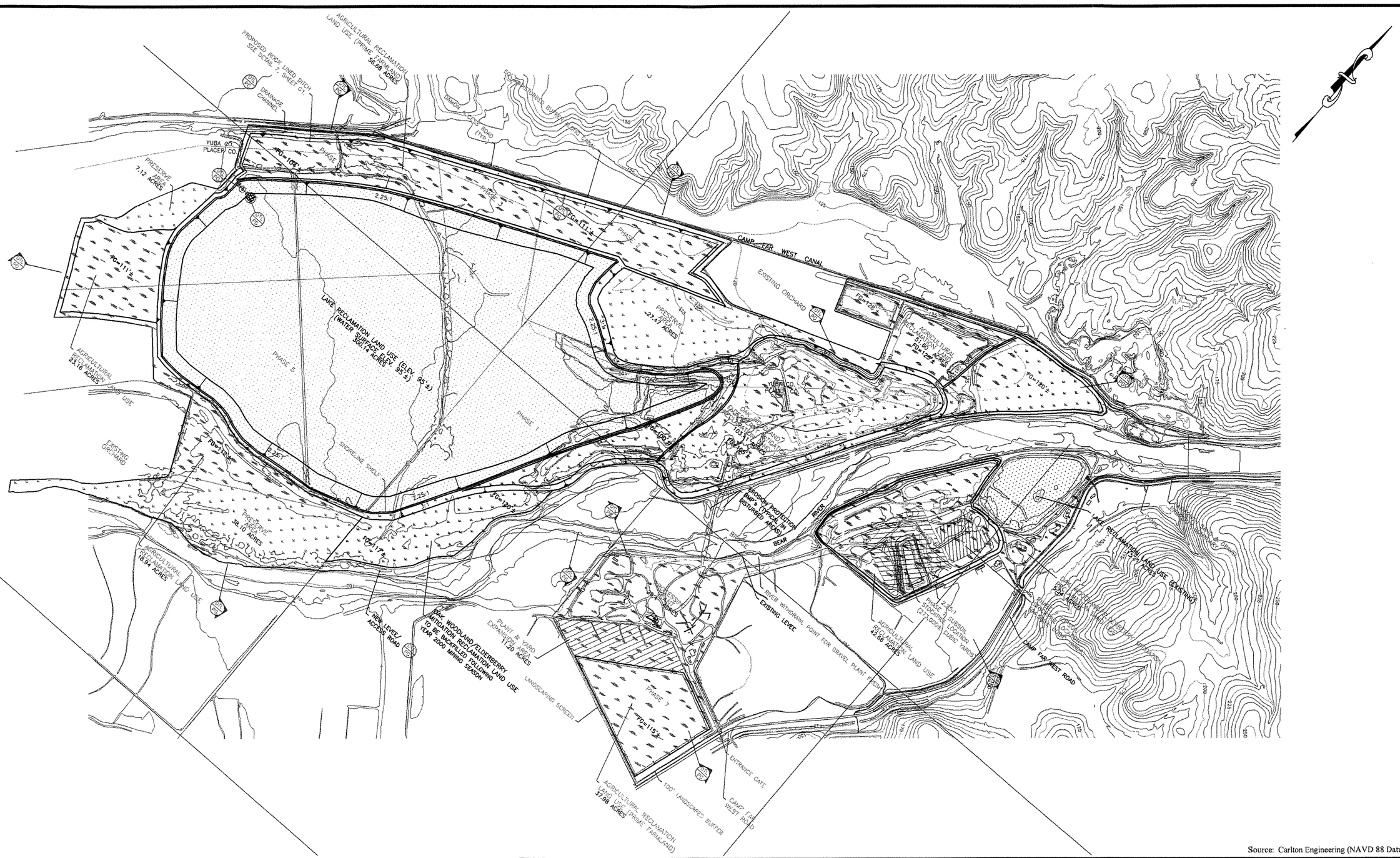
Patterson Sand and Gravel
100-Year Flood Boundary
Existing Condition

0 200 400 600 800
Scale in Feet

Figure 9



Source: Carlton Engineering (NAVD 88 Datum)

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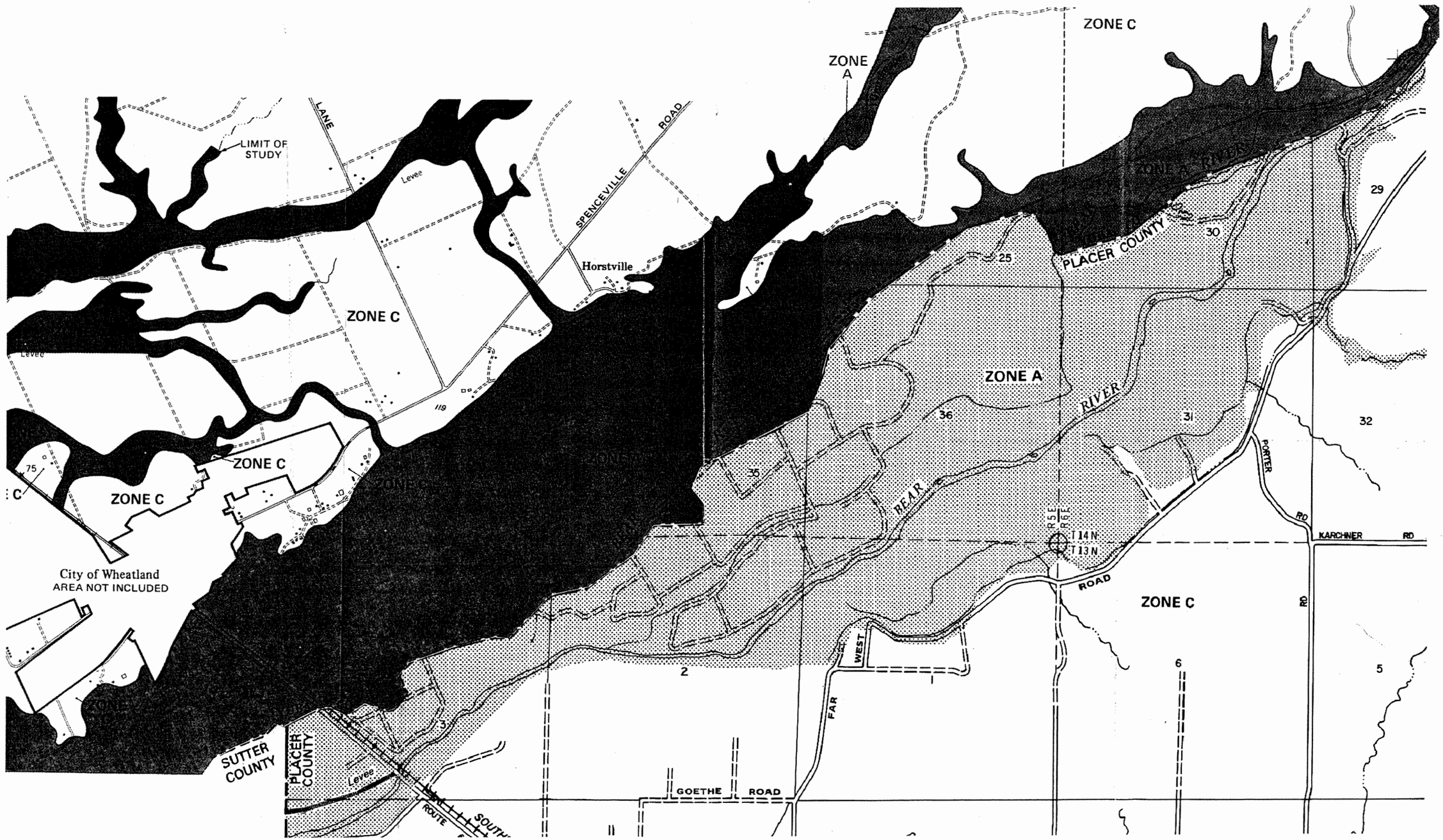
Patterson Sand and Gravel

Proposed Reclamation Plan

0 250 500 750 1000
Scale in Feet

Figure 10



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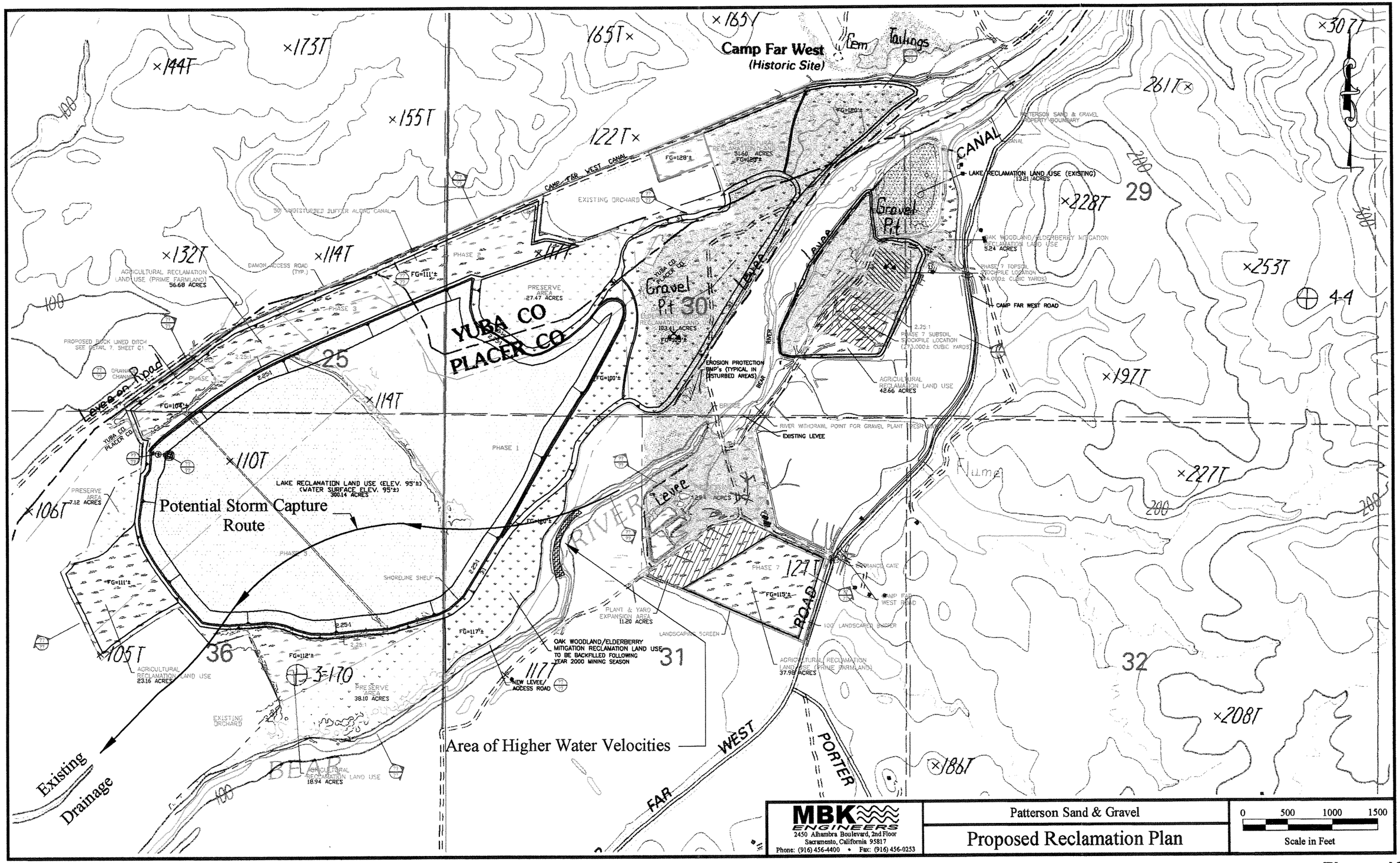
Patterson Sand & Gravel

Flood Insurance Rate Map

0 1000 2000 3000
Scale in Feet

Figure 12


Camp Far West
(Historic Site)
Tailings
CAMP FAR WEST CANAL
LAKE RECLAMATION LAND USE (EXISTING)
13.21 ACRES
PATTERSON SAND & GRAVEL PROPERTY BOUNDARY
Gravel Pit
Gravel Pit 30
YUBA CO
PLACER CO
YUBA RIVER
BEAR RIVER
EXISTING ORCHARD
50' UNDISTURBED BUFFER ALONG CANAL
AGRICULTURAL RECLAMATION LAND USE (PRIME FARMLAND)
56.68 ACRES
DAMON ACCESS ROAD (TYP.)
PROPOSED BUCK LINED DITCH SEE DETAIL 7, SHEET C1
DRAINAGE CHANNEL
Levee on Road
PRESERVE AREA
27.47 ACRES
RECLAMATION LAND USE
193.41 ACRES
EROSION PROTECTION BMP's (TYPICAL IN DISTURBED AREAS)
BRIDGE
RIVER WITHDRAWL POINT FOR GRAVEL PLANT FRESH WATER
EXISTING LEVEE
AGRICULTURAL RECLAMATION LAND USE
42.66 ACRES
OAK WOODLAND/ELDERBERRY MITIGATION RECLAMATION LAND USE
5.24 ACRES
PHASE 7 TOPSOIL STOCKPILE LOCATION (34,050± CUBIC YARDS)
CAMP FAR WEST ROAD
PHASE 7 SUBSOIL STOCKPILE LOCATION (273,000± CUBIC YARDS)
Flume
Potential Storm Capture Route
LAKE RECLAMATION LAND USE (ELEV. 99'±)
(WATER SURFACE ELEV. 95'±)
300.14 ACRES
PRESERVE AREA
7.12 ACRES
PHASE 3
PHASE 2
PHASE 1
SHORELINE SHELF
PLANT & YARD EXPANSION AREA
11.20 ACRES
LANDSCAPED SCREEN
NEW LEVEE/ ACCESS ROAD
OAK WOODLAND/ELDERBERRY MITIGATION RECLAMATION LAND USE TO BE BACKFILLED FOLLOWING YEAR 2000 MINING SEASON
Area of Higher Water Velocities
AGRICULTURAL RECLAMATION LAND USE
23.16 ACRES
PRESERVE AREA
38.10 ACRES
AGRICULTURAL RECLAMATION LAND USE
18.94 ACRES
EXISTING ORCHARD
AGRICULTURAL RECLAMATION LAND USE (PRIME FARMLAND)
37.98 ACRES
ENTRANCE GATE
100' LANDSCAPED BUFFER
Existing Drainage
FAR WEST ROAD
PORTER ROAD
25
29
31
32
36
2.25:1
4-4
FG=128'±
FG=111'±
FG=104'±
FG=120'±
FG=100'±
FG=117'±
FG=112'±
FG=115'±
3=170
1177
127T
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Patterson Sand & Gravel
Proposed Reclamation Plan
0 500 1000 1500
Scale in Feet

Figure 13